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FPU-16

A-B PROTOCOL/DATA LOGGER MANUAL

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PRELIMINARY

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DISCLAIMER

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1. COMPUTER INTERFACE DESCRIPTION

The protocol is based on the half-duplex master/slave Allen-Bradley (AB) Data Highway Protocol (DF1) as described in Allen-Bradley Publication 1771-6.5.16 and SCADA Applications Guide Publication CMGI-11.2.

The communication system consists of a single master and up to 30 slaves, connected to a two-wire, multidrop network. The FPU-16's are the slave devices on this network. The master is an IBM PC/AT, PLC-2 1771-KGM, PLC-5, SLC-500, or equivalent master running the DF1 half-duplex protocol.

The master requires a RS232 to RS485 converter to generate the 2-wire multidrop network. The RS-485 converter should have automatic send-data control (SD). SD control does not require hand-shaking lines since it uses the data line to control the RS-485 transmitter. The RS485 network is connected directly to the FPU-16 slaves via 2-wire cable.

The following A-B devices have master capability:

- SLC-5/03 and SLC-5/04 on channel 0. (OS 302 and OS 401)
- 1771 KGM DH SCADA Master Module
- PLC-5/11, -5/20, -5/30, -5/40, -5/60, -5/80 on channel 0.

See Publication 1770-6.5.16 for additional devices.

PLC-2 unprotected read (CMD=1) is used to retrieve information from the FPU-16 and PLC-2 unprotected write (CMD=8) is used to make set-point changes and to perform reset functions.

The unprotected read and write commands are compatible with the SLC-5/03, -5/04 (SLC) series, PLC-2, PLC-3, and PLC-; however, because of address limitations, SLC access is limited to set point and display memory. Data logging information is not accessible using the standard RS-232 interface port on the SLC-5/03 -5/04 processor.

2. SOFTWARE PROTOCOL DESCRIPTION

For specific details on the AB protocol, refer to AB publication 1770-6.5.16. This publication is recommended for anyone designing a software driver for use with the FPU-16.

The hexadecimal and octal number system is used in this manual. Value representations use the "C" convention. For hexadecimal, 0x precedes the value and for octal, 0 precedes the value.

3. FPU-SPECIFIC INFORMATION

The FPU-16 serial-port data base is updated every 300 ms. Database values can be read one by one or as a group. Since these values are updated every 300 ms, the master need not read these values any faster than 300 ms. In the case of set-point write or reset commands, only one set point or reset command may be sent every 300 ms.

On a system with multiple FPU's, the throughput of the network can be improved by using the broadcast address in the message. The message is processed simultaneously in all FPU's. The message can be retrieved sequentially from all devices using the POLLING PACKET.

All 16-bit values are transferred with the low byte followed by the high byte.

3.1 COMMAND FORMAT (CMD)

Two commands are supported to read and write values to the FPU-16.

For a read command (CMD=01), the DATA portion of the master packet contains a 16-bit value for ADDR and an 8-bit value for SIZE. ADDR is the starting byte address of the data-base memory and SIZE specifies the number of bytes to transfer. Since all data-base values are 16 bits, SIZE should always be an even multiple of 2.

In some PLC's, ADDR may be the word address and SIZE may be the element size. Please check the PLC documentation since this affects the message instruction.

For write commands (CMD=08), the DATA portion of the master packet contains two 16-bit values, ADDR and VAL. VAL contains the set-point value or the reset code.

Read Command Master-Packet Format:

DLE SOH STN DLE STX DST SRC CMD STS TNS ADDR SIZE DLE ETX CRC/BCC

|

01

Read-Command Slave-Packet Format:

DLE STX DST SRC CMD STS TNS DATA DLE ETX CRC/BCC

|

41

Write Command Master-Packet Format:

DLE SOH STN DLE STX DST SRC CMD STS TNS ADDR VAL DLE ETX CRC/BCC

|

08

The FPU-16 replies with DLE ACK to this packet and processes the data. The reply message is sent to the output message buffer and is held until the POLLING PACKET is received. The reply message will have CMD equal to 48 and will have the STS equal to 0 if no error occurred.

On an error, a message packet is generated with the error code stored in the STS byte.

DLE STX DST SRC CMD STS TNS DLE ETX CRC

|

48

3.2 DATA BASE

3.2.1 SET POINT MEMORY

You can read or write to the set-point memory. The protocol allows individual or groups of set points to be read; however, set points must be written one at a time and only one set point may be changed every 300 ms.

The memory address of the data-base value (ADDR) is a 16-bit pointer that points to the high-order byte of the 16-bit word. The memory-address pointer (ADDR) must always be even. ADDR or ADDR+SIZE should not exceed the set-point memory size.

Set-point memory is organized in 16 bit words. Data-base values less than 256 will have 0 stored in the high-order byte. Data-base values are transmitted as two 8-bit bytes, with the low byte transmitted first.

Set-point write instructions must have the data in the 16-bit format. The address (ADDR) must be one of the valid data-base addresses listed in the table. VAL contains the 16-bit set-point value. Set-point values greater than the delete value are forced to the appropriate delete value. For set points with no delete value, the maximum value of the range is stored. Set-point values below the minimum are forced to the minimum value.

Set-point memory is mapped in two locations, 0 to 0x22 and 0x100 to 0x122. The lower mapping is provided to support SLC-500 applications because the SLC-500 cannot read PLC-2 addresses larger than byte address 255.

TABLE 1. SET POINT MEMORY

LOW MAP	HIGH MAP					
DEC [2] BYTE ADDR	BYTE ADDR	WORD ADDR	SET POINT (16 Bit)	RANGE	DELETE	INCREMENT
0	0x100	0200	I²t Trip	1-45	46	1
2	0x102	0201	I²t Alarm	1-45	46	1
4	0x104	0202	Short-Time Trip [1]	10-90	91	1
6	0x106	0203	Short-Time Alarm [1]	10-90	91	1
8	0x108	0204	Instantaneous Trip [1]	10-90	91	1
10	0x10A	0205	Instantaneous Alarm [1]	10-90	91	1
12	0x10C	0206	Unbalance Trip	5-75	76	1
14	0x10E	0207	Unbalance Alarm	5-75	76	1
16	0x110	0210				
18	0x112	0211				
20	0x114	0212	Earth-Leakage Trip	1-100	101	1
22	0x116	0213	Earth-Leakage Alarm	1-100	101	1
24	0x118	0214	FLA	(.45-.93)	*CT-Primary	Rating
26	0x11A	0215				1
28	0x11C	0216	Mode 8 Level 1	0-255		1
30	0x11E	0217	Mode 8 Level 2	0-255		1
32	0x120	0220	CT-Primary Rating	20-1200		5
34	0x122	0221	EFCT-Primary Rating	5, 50-2000		50

(1) Set point is 10 times actual value.

(2) This is the data offset in the SLC message instruction.

The high-order nibble of Mode 8 level 2 contains the FPU station address. This value cannot be changed via the serial port.

3.2.2 DISPLAY MEMORY

Display memory is read-only memory organized in 16 bit words. Display values less than 256 will have 0 stored in the high-order byte. Data-base values are transmitted as two 8-bit bytes, with the low byte transmitted first. The memory address of the data-base value (ADDR) is a 16-bit pointer that points to the high-order byte of the 16-bit word. The memory-address pointer (ADDR) must always be even. ADDR or ADDR + SIZE should not exceed the display memory address size.

TABLE 2. DISPLAY MEMORY

LOW MAP	HIGH MAP		
DEC [3] BYTE ADDR	BYTE ADDR	WORD ADDR	DESCRIPTION
48	0x130	0230	Phase A Current
50	0x132	0231	Phase B Current
52	0x134	0232	Phase C Current
54	0x136	0233	Unbalance
56	0x138	0234	Earth Leakage [1]
58	0x13A	0245	Percent I²t
60	0x13C	0236	Pre-Trip Phase A Current
62	0x13E	0237	Pre-Trip Phase B Current
64	0x140	0240	Pre-Trip Phase C Current
66	0x142	0241	Pre-Trip Unbalance
68	0x144	0242	Pre-Trip Earth Leakage [1]
70	0x146	0243	Pre-Trip I²t
72	0x148	0244	Operation Count
74	0x14A	0245	Reset Time
76	0x14C	0246	Spare
78	0x14E	0247	Station Address of FPU [2]
80	0x150	0250	Trip Status Bits
82	0x152	0251	Alarm Status Bits
84	0x154	0252	FPU-16 Status Bits
86	0x156	0253	Communications Software Revision

[1] Divide reading by 10 for actual amperes. Resolution 1/10 A.

[2] The high-order byte is the product ID and is equal to 1 for the FPU-16.

[3] This is the data offset in the SLC message instruction.

3.2.3 RESET MEMORY

The memory locations 0xF0 and 0x1F0 (octal word address 0370) is reserved for the reset function and is a write-only location. The 16-bit data specifies the reset function. A write to address 0xF0 or 0x1F0 will perform the function indicated. Only one reset function is processed every 300 ms.

TABLE 3. RESET MEMORY

DATA	DESCRIPTION
0000	Null Function [1]
0001	Trip Reset
0002	Latched-Alarm Reset
0003	Not used
0004	Emergency Thermal Reset
0005	Not used
0006	Memory Fault Reset

[1] This function accesses the FPU-16 processor but does not perform any function. Used for testing.

3.2.4 TRIP-STATUS-BIT DEFINITIONS

The trip-status bits indicate the FPU-16 trip conditions.

TABLE 4. TRIP-STATUS BITS

BIT NUMBER	TRIP FUNCTION
0 (LSB)	1 = I²t Trip
1	1 = Short-Time Trip
2	1 = Instantaneous Trip
3	1 = Unbalance Trip
4	1 = Earth-Fault Trip
5	Not Used
6	Not Used
7	1 = Memory-Fault Trip

3.2.5 ALARM-STATUS-BIT DEFINITIONS

The alarm-status bits indicate the FPU-16 alarm conditions.

TABLE 5. ALARM-STATUS BITS

BIT NUMBER	ALARM FUNCTION
0 (LSB)	1 = I²t Alarm
1	1 = Short-Time Alarm
2	1 = Instantaneous Alarm
3	1 = Unbalance Alarm
4	1 = Earth-Leakage Alarm
5	Not Used
6	Not Used
7	1 = Memory-Fault Alarm

3.2.6 FPU-16 STATUS DEFINITIONS

These bits define the FPU status.

TABLE 6. FPU-16 STATUS BITS

BIT NUMBER	FUNCTION
0 (LSB)	1 = Load Current > 10%
1	1 = Contact Closed, 0 = Contact Open

4. FPU-16 DATA LOGGING OPTION

NOTE: This data is not accessible using the standard RS-232 interface on the SLC-500 processor.

The FPU-16 data logger captures time-stamped meter data using either a time or event trigger mechanism. Captured records are stored in non-volatile memory, which has a data retention of at least 10 years. The real-time clock (RTC) continues to operate even without control voltage.

Configuration registers are used to configure the data logger. The same command format as described in section 4 is used for data logger communication. Unlike the set point and reset memory however, the data logger allows for multiple writes to the configuration registers.

4.1 CONFIGURATION REGISTERS

Table 10 shows the address location of each register.

TABLE 7. CONFIGURATION REGISTERS

HEX BYTE ADDRESS	OCT WORD ADDRESS	DEC WORD ADDRESS	DESCRIPTION
0x200	400	256	4-Digit Year (BCD)
0x202	401	257	MSB: Month LSB: Date (BCD)
0x204	402	258	MSB: Day LSB: Hour (BCD)
0x206	403	259	MSB: Minute LSB: Second (BCD)
0x208	404	260	Sample Interval in Seconds
0x20A	405	261	Trigger Duration
0x20C	406	262	Control
0x20E	407	263	Trip Status Trigger Mask
0x210	410	264	Alarm Status Trigger Mask
0x212	411	265	FPU-16 Status Trigger Mask
0x214	412	266	Record Counter (Read Only)

4.2 REGISTER DEFINITIONS

16-bit registers are used to configure the data logger.

0x200: (Read/Write)

4-DIGIT YEAR (Bits 0:15)

YEAR: 1995 to 2094 BCD

Writes to the high-order byte of YEAR are ignored. The data logger will write data to the high-order byte of YEAR based on the value in the low-order byte.

For low-byte BCD values up to 94, the BCD value in the high byte is 20 to cover the range 2000 to 2094. For low-byte BCD values greater than 94, the high byte is 19 to cover the range 1995 to 1999.

0x202: (Read/Write)

MONTH (Bits 8:15)	DATE (Bits 0:7)

MONTH: 01 to 12 BCD
DATE: 01 to 31 BCD

0x204: (Read/Write)

DAY (Bits 8:15)	HOUR (Bits 0:7)

DAY: 01 to 07 BCD
HOUR: 00 to 23 BCD (24 Hour format)

0x206: (Read/Write)

MINUTE (Bits 8:15)	SECOND (Bits 0:7)

MINUTES: 00 to 59 BCD
SECONDS: 00 to 59 BCD

0x208: (Read/Write)

SAMPLE INTERVAL IN SECONDS (Bits 0:15)

SAMPLE INTERVAL: 1 to 65536 Seconds

A sample interval of 0 is not valid.

0x20A: (Read/Write)

POST-TRIGGER DURATION (Bits 0:7)

POST TRIGGER DURATION: 0 to 249 (Valid in event-mask-trigger mode only). The duration count specifies the number of additional records captured after an event-trigger occurs. The time between records is defined by the sample interval.

If a trigger occurs while the duration counter is active, this record will be captured but the duration count will not be initialized. The duration count is initialized only at the occurrence of the first event.

0x20C: (Read/Write)

	CLOCK ENABLE (Bit 4)	CLEAR COUNTER (Bit 3)	MODE (Bits 0:2)

CONTROL:

MODE:

0: Disable data logging.

1: Set trigger to TIME and start recording.

2: Set trigger to EVENT MASK mode and enable trigger.

3: Not used.

CLEAR COUNTER:

0: The record counter is not cleared.

1: The record counter is cleared.

This bit is cleared by the data logger when the counter has been cleared.

CLOCK ENABLE:

0: Clock OSC is turned off. (RTC not running)

1: Clock OSC is on.

0x20E: (Read/Write)

16-BIT TRIP STATUS TRIGGER MASK (Bits 0:15)

TRIP STATUS TRIGGER MASK: Bits that are set in the mask register enables triggering for the corresponding trip-status bit. For triggering to occur, the selected trip-status bits must be all zero prior to one of the bits going high.

0x210: (Read/Write)

16-BIT ALARM STATUS TRIGGER MASK (Bits 0:15)

ALARM STATUS TRIGGER MASK: Bits that are set in the mask register enables triggering for the corresponding alarm-status bit. For triggering to occur, the selected alarm-status bits must be all zero prior to a transition to 1.

0x212: (Read/Write)

16-BIT FPU-16 STATUS TRIGGER MASK (Bits 0:15)

FPU-16 STATUS TRIGGER MASK: Bits that are set in the mask register enables triggering for the corresponding FPU-16 status bit. If any of the enabled bits change state, triggering occurs.

0x214: (Read Only)

RECORD COUNTER

RECORD COUNTER: Counts the number of records captured. This is a read-only location and is cleared by using the control register.

4.3 TRIGGER DESCRIPTION

With the trigger mode set to TIME, the data logger stores records at fixed time intervals. The time unit is defined by SAMPLE INTERVAL. In the TIME mode, any trip, alarm or FPU-16 status that matches the mask bits will also be recorded. TRIGGER DURATION does not apply in TIME mode. When the number of records exceeds 250, new records overwrite old records.

With the trigger mode set to EVENT MASK, the data logger is configured to trigger on a specific trip, alarm or FPU-16 status condition. The trigger-mask bits define which trip, alarm or FPU-16 status bits will initiate the trigger. Event mask bit locations correspond to the trip-status, alarm-status, and FPU-16 status bits defined in the communications protocol. To enable triggering on a status bit, the corresponding mask bit is set. All selected bits in the trip or alarm status must be zero to arm the trigger. When any or all of the bits in the trip or alarm status transition from zero to one, the data-logger will be triggered. When triggered, the data logger will store the number of records defined by TRIGGER DURATION with a time interval defined by the sample unit/interval settings. In the case of the FPU-16 status, not all bits have to be zero to arm the trigger. Any bit that changes state causes a trigger.

4.4 DATA-LOGGING RECORD FORMAT

Up to 250 records are stored in non-volatile memory. These records are read-only and are retrieved by specifying the starting address and length for the record. Each record requires a separate read request. The first record (record 0) is always the latest record, and record 249 is always the last record. Each record consists of the following data (Record 0 addresses shown):

TABLE 8. DATA LOGGER RECORD FORMAT

HEX BYTE ADDRESS	OCT WORD ADDRESS	DEC WORD ADDRESS	DESCRIPTION
0x300	600	384	4-Digit Year (BCD) MSB: Month LSB: Date (BCD) MSB: Day LSB: Hour (BCD) MSB: Minute LSB: Second (BCD) Trip Status Alarm Status FPU-16 Status Phase A (A) Phase B (A) Phase C (A) Earth Leakage (x10 A) I^2t (%) Operations Count Pre-Trip Phase A (A) Pre-Trip Phase B (A) Pre-Trip Phase C (A) Pre-Trip Unbalance (%) Pre-Trip Earth Leakage (x10 A) Pre-trip I^2t (%)

The starting address (decimal) for a record is defined by:
Address = ***768*** + (Record_Number*48)
Where Record_Number=0 is the latest record.

NOTE: The record length is a maximum of 24 words or 48 bytes.

5. FPU-16 STATION-ADDRESS SELECTION

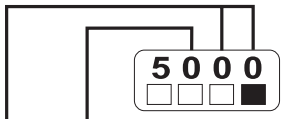
The second level of the Mode-5 program option is used to specify the FPU-16 station address (STN).

Value digits 2 and 3 indicates a decimal address from 0 to 63. Address 0 is the default value and inhibits serial communication.

Value digit 1 indicates the relay operating mode.

TABLE 9. MODE-5 PROGRAM OPTIONS (2nd Level)

DEFAULT VALUE 5000



VALUE DIGIT 1	RELAY OPERATING MODE
0	TRIP-RELAY FAIL SAFE ALARM RELAY-FAIL SAFE
1	TRIP-RELAY FAIL SAFE ALARM-RELAY NON FAIL SAFE
2	TRIP-RELAY NON FAIL SAFE ALARM-RELAY FAIL SAFE
3	TRIP-RELAY NON FAIL SAFE ALARM-RELAY NON FAIL SAFE

VALUE DIGITS 2 & 3	FPU ADDRESS
0 0	COMMUNICATIONS INHIBITED
0 1	FPU 1
.	.
.	.
.	.
.	.
6 3	FPU 63

6. CONFIGURATION SWITCHES

The configuration switches are accessible through the slot on the back of the FPU-16. When viewed from the rear, SW1 is the right-most switch. A switch is CLOSED when the actuator is up (toward the PCB) and OPEN when the actuator is down (away from the PCB). SW4 and SW5 are not used.

NOTE: SW6 is used for software-update programming and MUST be in the OPEN position.

6.1 BAUD RATE

Switches 1 to 3 are used to select the communication baud rate.

TABLE 10. BAUD RATE

BAUD	SW1	SW2	SW3
9600	OPEN	CLOSED	OPEN
4800	CLOSED	CLOSED	(Default)
2400	OPEN	OPEN	OPEN
1200	CLOSED	OPEN	CLOSED
600	OPEN	CLOSED	CLOSED
300	CLOSED	CLOSED	CLOSED
			CLOSED

6.2 TURN-AROUND DELAY

Switch 7 is used to enable the turn-around or response delay.

TABLE 11. TURN-AROUND DELAY

DELAY	SW7
Enabled	CLOSED (Default)
Disabled	OPEN

The response delay is a function of the baud rate selected and will not be less than the value shown in the table.

TABLE 12. RESPONSE DELAY

BAUD RATE	DELAY
9600	4 ms
4800	4 ms
2400	8 ms
1200	12 ms
600	20 ms
300	41 ms

6.3 ERROR—CHECK TYPE

Switch 8 selects the error-checking format as block checking (BCC) or cyclic redundancy checking (CRC).

TABLE 13. ERROR CHECKING

ERROR-CHECK TYPE	SW8
BCC	CLOSED (Default)
CRC	OPEN

7. SPECIFICATIONS

Interface ..... Isolated RS485, 2 wire multi-drop, half duplex.

Protocol ..... AB Half Duplex DFI/ master-slave.

Baud Rate ..... 300 to 9600 Baud.

Bit Format ..... 8 bits, no parity, one stop bit.*

Number of FPU's Connected ..... Maximum of 30 units.♦

Line length ..... 1200 meters total.

Isolation Voltage ..... 300 Vac continuous

Dielectric ..... 1500 Vac

* Terminal 23 (-) is negative with respect to terminal 24 (+) for a binary 1 (MARK or OFF) state.

Terminal 23 (-) is positive with respect to terminal 24 (+) for a binary 0 (SPACE or ON) state.

♦ Can be expanded to 62 units with repeater.

8. INTERFACE CONVERTER

A communication master with a RS-232 port requires an SE-485-PP RS-232 to RS-485 converter. This converter monitors the data from the master and sets the transmitter ON or OFF based on activity on the RS-232 transmit line.

8.1 NETWORK INTERCONNECTION

FPU-16 communication ports are interconnected using a two-wire twisted pair cable. Communication ports are connected in a daisy-chain method. All FPU-16 + terminals are connected to the (B) terminal on the converter and all FPU-16 - terminals are connected to the (A) terminal on the converter.

8.2 RS-485 TERMINATION

Termination resistors are required for line lengths greater than 25 meters. Termination resistors are normally selected to match the characteristic impedance of the communication line, and are installed at each end of the network.

When the RS-485 line is idle, all of the RS-485 devices are in a receive state. Since the line is not driven, the voltage across the twisted-pair cable is zero. This results in an unknown output state on the master's RS-485 converter which can cause communication problems with the master software.

To force the RS-485 line to a known state, each FPU-16 has a 100K pull-up resistor connected from the internal 5-volt supply to the (+) line and a 100K pull-down resistor connected from the (-) terminal to internal circuit ground.

The combination of the pull-up, pull-down, and termination resistances results in a voltage on the RS-485 line that must be greater than the 200 mV threshold of the RS-485 receiver to guarantee a valid idle state.

For the RS-485 network used with the FPU-16, the termination consists of a 150-ohm resistor in series with a 0.1 µf capacitor.

This combination satisfies the valid idle-state requirements and provides the 150-ohm termination for the cable.

9. PLC-5 PROGRAMMING

9.1 CHANNEL CONFIGURATION

FPU-16 communication can only be established using channel 0. In the channel overview menu, select SYSTEM (MASTER) for channel 0.

A typical channel configuration is shown below.

SYSTEM MODE (DFI MASTER)
CHANNEL 0 CONFIGURATION

Diag. file:	N10		
Remote mode change:	DISABLED	System mode char.:	S
Mode attention char.:	\0x1b	User mode char.:	U
Baud rate:	9600	Parity:	NONE
Stop bits:	1	Station address:	0
Control line:	NO HANDSHAKING		
Reply msg wait (20 ms):	50	Error detect:	BCC
ACK time-out (20 (ms):	50	RTS send delay (20 ms):	0
DF1 retries:	3	RTS off delay (20 ms):	0
Msg appl time-out (30 sec):	1		
Polling mode: MESSAGE BASED (Do Not Allow Slave To Initiate Messages)			
Master message transmit: BETWEEN STATION POLLS			
Normal pole node file:	N11	Priority poll node file:	N12
Active station file:	B13	Normal poll group size:	3

The station address is the address of the master not the FPU-16 address.

9.2 MESSAGE INSTRUCTION

The message instruction (MG) is used to read data to or write data from the FPU-16. The following is a message instruction to need 18 words of data starting at FPU-16 word address 200. The data is stored starting at PLC-5 file address N11:0.

Communication Command:	PLC-2 Unprotected Read
PLC-5 Data Table Address:	N11:0
Size In Elements:	18
Local/Remote:	Local
Remote Station:	N/A
Link ID:	N/A
Remote Link Type:	N/A
Local Node Address:	1
Destination Data Table Address:	200
Port Number:	00

9.2.1 COMMUNICATION COMMAND

For reading data use PLC-2 UNPROTECTED READ. For write command use PLC-2 UNPROTECTED WRITE.

9.2.2 PLC-5 DATA TABLE ADDRESS

For write instructions, this is the starting address of the data in the PLC to be sent to the FPU-16. The element size is always 1 for write instructions to the FPU-16. The following is a message instruction to perform reset functions.

Communication Command:	PLC-2 Unprotected Read
PLC-5 Data Table Address:	N19:0
Size In Elements:	1
Local/Remote:	Local
Remote Station:	N/A
Link ID:	N/A
Remote Link Type:	N/A
Local Node Address:	001
Destination Data Table Address:	370
Port Number:	00

In this instruction, the reset code stored in N19:0 is sent tot FPU-16 #1 location 370.

For read instructions, the Data Table Address specifies the starting address within the PLC where the data from the FPU-16 will be stored. The starting address in the FPU-16 and element size must be within the data base range of the FPU-16.

9.2.3 SIZE IN ELEMENTS

Specifies the number of words to read or write. The element size is always 1 for write instructions.

9.2.4 LOCAL/REMOTE

This setting should be set to Local. All FPU-16's are local units connected to the PLC. Remote Station, Link ID, and Remote Link Type are N/A.

9.2.5 LOCAL NODE ADDRESS

This is the address of the FPU-16 connected to the local link.

9.2.6 DESTINATION DATA TABLE ADDRESS

Specifies the starting address in the FPU-16 of the sources or destination data.

9.2.7 PORT NUMBER

Specifies the channel for communications and must always be 0 for FPU-16 communications.

9.3 DIAGNOSTICS

The PLC-5 Data Monitor screen can be used to determine if the message instructions are executing properly. The PLC-5 Programming Software manual provides detailed descriptions of the status bits and error codes.

MESSAGE INSTRUCTION DATA MONITOR FOR CONTROL BLOCK MG9:1

Communication Command:	PLC-2 UNPROTECTED READ		
PLC-5 Data Table Address:	N17:10		
Size in Elements:	19	ignore if timed-out:	0 TO
Local/Remote	LOCAL	to be retried:	0 NR
Remote Station:	N/A	awaiting execution:	1 EW
Link ID:	N/A	continuous:	1 CO
Remote Link Type:	N/A	error:	0 ER
Local Node Address:	001	message done:	1 DN
Destination Data Table Address:	230	message transmitting:	0 ST
Port Number:	00	message enabled:	1 EN
Error Code:	0000 (HEX)		

The channel 0 status screen shows error counters that provide an overview of communications errors.

SYSTEM MODE (DF1 Master)
CHANNEL 0 STATUS

DCD Recover:	0	Lost Modem:			0
Message sent:	2494	Undelivered messages:			0
Messages received:	2494	Messages retry:			0
EOT received on first poll:	0	Bad packet/no ACK:			0
		Duplicate messages received:			0
Normal poll list scan (100 ms)		last:	0	max:	0
Priority poll list scan (100 ms)		last:	0	max:	0

Modem lines

DTR	DCD	DSR	RTS	CTS
ON	ON	ON	OFF	OFF

10. SLC-500 APPLICATIONS

10.1 CHANNEL CONFIGURATION

Channel 0 (RS-232) is used for MPU communications. As a result, this port cannot be used as a programming port. Use the DH+ port for programming.

Set channel 0 for DF1 Half-Duplex Master, 9600 baud, and no parity. The SE-485-PP, RS-232 to RS-485 converter connects directly to the RS-232 port on the SLC-5/04 processor.

10.2 READ MESSAGES

Set the message information as follows:

Read/Write: Read
Target Device: 485CIF
Local/Remote: Local
Control Block: N7:0

The 485CIF selection enables PLC-2 addressing required by the FPU-16. The Control Block file contains the SLC MSG configuration data and is selectable by the user.

Set the Data Table Address to the destination file (N9:0) in the SLC. The Size in Elements specifies the number of registers to read from the FPU. The Data Table Offset specifies the byte offset in the FPU where the data read starts. For example, to read all display memory, set the Size in Elements to 20 and set the Data Table Offset to 48 (start of display memory).

10.3 WRITE MESSAGES

Data can be written to set-point and command memory. For the SLC, the set-point address range is 0 to 34 with command memory located at 250 (0xF0).

Set the message information as follows:

Read/Write: Write
Target Device: 485CIF
Local/Remote: Local
Control Block: N7:0

The data Table Address is set to the location in the SLC where the data is located (N9:0). Size in Elements must be 1. Set the Data Table Offset to the byte address location in the FPU where the data is to be sent. For example, to reset the FPU, enter 1 in the N9:0 location and set the Data Table Offset to 250. When the message runs, the reset command is sent to the FPU.

11. REVISION HISTORY

The number in the protocol type description on the serial number label is the software revision number for the data logger.

Year 2000 compliance starts at revision 2.0. The integer value of the revision number can be obtained by reading hex byte address 0x156 as shown in Table 5.

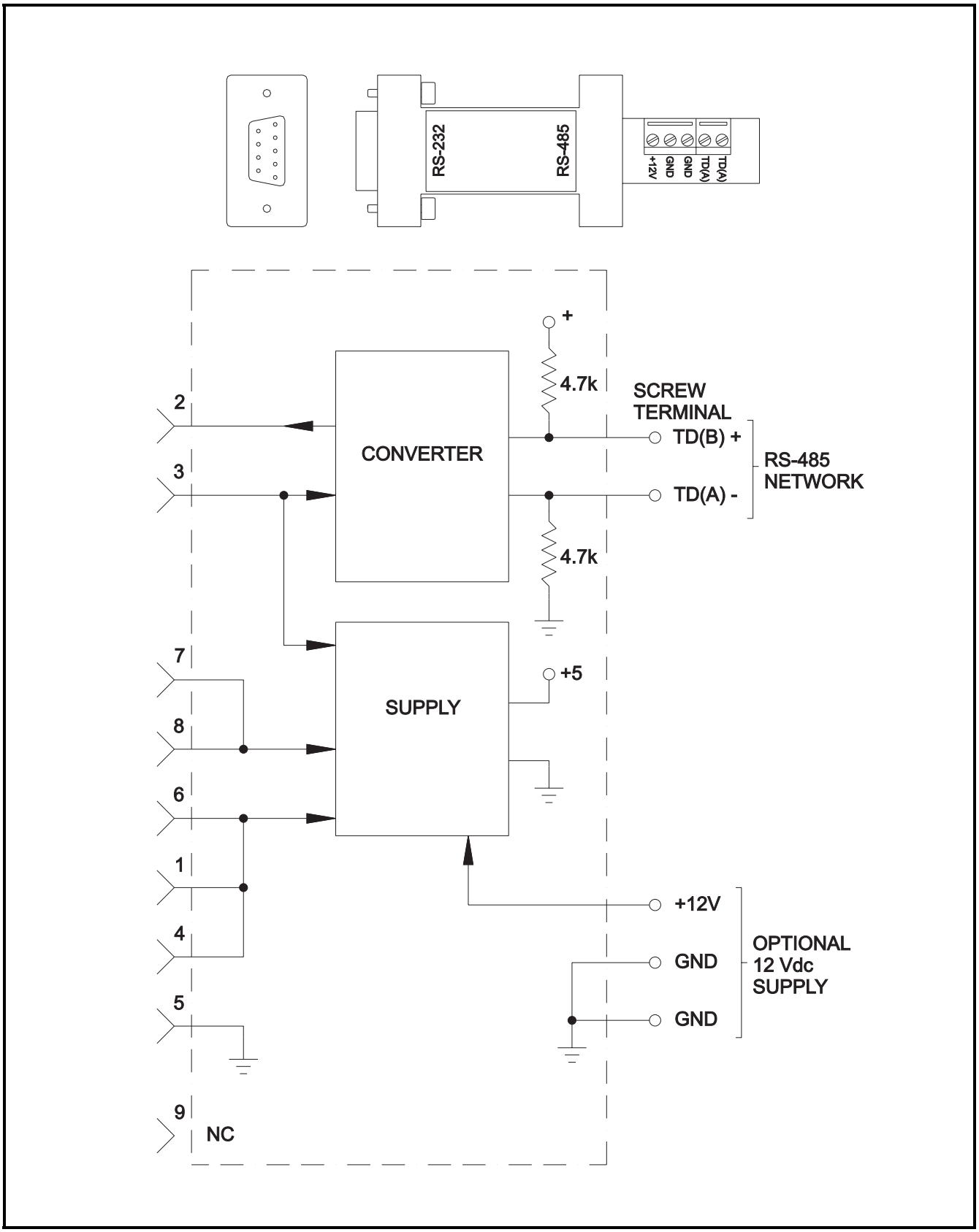


FIGURE 1. SE-485-PP Port Powered RS-232 to RS-485 Converter.